

## Appendix E

### SUMMARY OF AIR QUALITY IMPACT ANALYSIS FOR THE METCALF ENERGY CENTER

*April 18, 2000*

#### BACKGROUND

Calpine Corporation and Bechtel Enterprises Holdings, Inc. have submitted a permit application (# 27215) for a proposed 600-MW combined cycle power plant, the Metcalf Energy Center. The facility is to be composed of two natural gas-fired turbines with heat recovery steam generators, one steam turbine and supplemental burners (duct burners), a cooling tower, plus an emergency generator and fire pump engine. The proposed project will result in an increase in air pollutant emissions of NO<sub>2</sub>, CO, PM<sub>10</sub> and SO<sub>2</sub> triggering regulatory requirements for an air quality impact analysis.

#### AIR QUALITY IMPACT ANALYSIS REQUIREMENTS

Requirements for air quality impact analysis are given in the District's New Source Review (NSR) Rule: Regulation 2, Rule 2.

The criteria pollutant annual worst case emission increases for the Project are listed in Table E-1, along with the corresponding significant emission rates for air quality impact analysis.

Table E-1  
Comparison of Proposed Project's Annual Worst Case Emissions  
to Significant Emission Rates for Air Quality Impact Analysis

Pollutant	Proposed Project's Emissions (tons/year)	Significant Emission Rate (tons/year) (Reg-2-2-304 to 2-2-306)	EPA PSD Significant Emission Rates for major stationary sources
NO <sub>x</sub>	185.6	100	40
CO	736.0	100	100
PM <sub>10</sub>	98.6	100	15
SO <sub>2</sub>	10.6	100	40

Table E-1 indicates that the proposed project emissions exceed the significant emission levels for nitrogen oxides (NO<sub>x</sub>), and carbon monoxide (CO). Therefore the source is classified as a major stationary source as defined under the Federal Clean Air Act. Therefore, the air quality impact must be investigated for all pollutants emitted in quantities larger than the EPA PSD significant

emission rates (shown in the last column in Table E-1). Table E-1 shows that the NO<sub>x</sub>, CO and PM<sub>10</sub> impacts must be modeled. The detailed requirements for air quality impact analysis for these pollutants are given in Sections 304, 305 and 306 of the District's NSR Rule and 40 CFR 51.166 of the Code of Federal Regulations.

The District's NSR Rule also contains requirements for certain additional impact analyses associated with air pollutant emissions. An applicant for a permit that requires an air quality impact analysis must also, according to Section 417 of the NSR Rule, provide an analysis of the impact of the source and source-related growth on visibility, soils and vegetation.

## **AIR QUALITY IMPACT ANALYSIS SUMMARY**

The required contents of an air quality impact analysis are specified in Section 414 of Regulation 2 Rule 2. According to subsection 414.1, if the maximum air quality impacts of a new or modified stationary source do not exceed significance levels for air quality impacts, as defined in Section 2-2-233, no further analysis is required. (Consistent with EPA regulations, it is assumed that emission increases will not interfere with the attainment or maintenance of AAQS, or cause an exceedance of a PSD increment if the resulting maximum air quality impacts are less than specified significance levels). If the maximum impact for a particular pollutant is predicted to exceed the significance impact level, a full impact analysis is required involving estimation of background pollutant concentrations and, if applicable, a PSD increment consumption analysis.

### ***Air Quality Modeling Methodology***

Maximum ambient concentrations of NO<sub>x</sub>, CO and PM<sub>10</sub> were estimated for various plume dispersion scenarios using established modeling procedures. The plume dispersion scenarios addressed include simple terrain impacts (for receptors located below stack height), complex terrain impacts (for receptors located at or above stack height), impacts due to building downwash, and impacts due to inversion breakup. Because the facility is not within 3 km of a shoreline of a large body of water, shoreline fumigations impacts were not modeled.

Emissions from the turbines will be exhausted from two 145 foot exhaust stacks. The project also includes a cooling tower (comprised of 10 cells) with a release height of 64 feet. Table E-2 contains the emission rates used in each of the modeling scenarios: turbine commissioning, start-up, maximum 1-hour, maximum 8-hour, maximum 24-hour, and maximum annual average. Commissioning is the original startup of the turbines and only occurs during the initial operation of the equipment after installation. The startup of one turbine was used as the basis for the emissions for startup conditions.

The applicant used the EPA models SCREEN3 and ISCST3. The models were run using 1993 meteorological data collected by IBM at its facility about three miles northwest of the proposed project site. Because the exhaust stacks are less than Good Engineering Practice (GEP) stack height, ambient impacts due to building downwash were evaluated. Because complex terrain was located nearby, complex terrain impacts were considered. Inversion breakup fumigation was evaluated using the SCREEN3 model. The Ozone Limiting Method was used to convert one-hour NO<sub>x</sub> impacts into one-hour NO<sub>2</sub> impacts. The Ambient Ratio Methodology (with a

default NO<sub>2</sub>/NO<sub>x</sub> ratio of 0.75) was used for determining the annual-averaged NO<sub>2</sub> concentrations.

Table E-2  
Averaging Period Emission Rates Used in Modeling Analysis (g/s)

Pollutant Source	Max (1-hour)	Commissioning <sup>1</sup> (1-hour)	Start-up <sup>2</sup> (1-hour)	Maximum (8-hour)	Maximum (24-hour)	Maximum Annual Average
NO <sub>x</sub>						
Turbine 1	2.42	45.36	10.08	n/a	n/a	2.66
Turbine 2	2.42					2.66
Fire Pump	0.49					0.011
Emergency Generator						0.0051
Cooling Tower						
CO						
Turbine 1	14.3	- <sup>3</sup>	113.65	48.5	n/a	n/a
Turbine 2	14.3			48.5		
Fire Pump						
Emergency Generator	0.38			0.047		
Cooling Tower						
PM <sub>10</sub>						
Turbine 1	n/a	n/a	n/a	n/a	1.43	1.30
Turbine 2					1.43	1.30
Fire Pump						0.00049
Emergency Generator					0.0015	0.00082
Cooling Tower					0.23	0.23

<sup>1</sup>Commissioning is the original startup of the turbines and only occurs during the initial operation of the equipment after installation. <sup>2</sup>Start-up is the beginning of any of the subsequent duty cycles to bring one turbine from idle status up to power production. <sup>3</sup>Emissions of CO during commissioning are not expected to be higher than during startup.

### ***Air Quality Modeling Results***

The maximum predicted ambient impacts of the various modeling procedures described above are summarized in Table E-3 for the averaging periods for which AAQS and PSD increments have been set. Shown in Figure 1 are the locations of the maximum modeled impacts.

Also shown in Table E-3 are the corresponding significant ambient impact levels listed in Section 233 of the District's NSR Rule. In accordance with Regulation 2-2-414 further analysis is

required for the 1-hour NO<sub>2</sub>, 8-hour CO, 24-hour PM<sub>10</sub>, and annual-averaged PM<sub>10</sub> modeled impacts. Further analysis is not required for the annual averaged NO<sub>2</sub> modeled impacts.

TABLE E-3  
Maximum Predicted Ambient Impacts of Proposed Project (µg/m<sup>3</sup>)  
[Overall maximum in bold type]

Pollutant	Averaging Time	Commissioning Maximum Impact	Startup Maximum impact	Fumigation Impact	ISCST3 Modeled Impact	Significant Air Quality Impact Level
NO <sub>2</sub>	1-hour annual	141	81.4	13.0	<b>188</b>	19
		-	-	-	<b>0.67</b>	1.0
CO	1-hour	-	<b>1943</b>	45.6	650	2000
	8-hour	-	-	31.9	<b>549</b>	500
PM <sub>10</sub>	24-hour annual	-	-	3.2	<b>9.3</b>	5
		-	-	-	<b>1.1</b>	1

### *Background Air Quality Levels*

Regulation 2-2-111 entitled “Exemption, PSD Monitoring,” exempts an applicant from the requirement of monitoring background concentrations in the impact area (section 414.3) provided the impacts from the proposed project are less than specified levels. Table E-4 lists the applicable exemption standards and the maximum impacts from the proposed facility. As shown, all modeled impacts are below the preconstruction monitoring threshold.

TABLE E-4  
PSD Monitoring Exemption Levels and Maximum Impacts  
from the Proposed Project for NO<sub>2</sub>, CO and PM<sub>10</sub> (µg/m<sup>3</sup>)

Pollutant	Averaging Time	Exemption Level	Maximum Impacts from Proposed Project
NO <sub>2</sub>	annual	14	0.67
CO	8-hour	575	549
PM <sub>10</sub>	24-hr	10	9.3

The District-operated San Jose 4<sup>th</sup> Street Monitoring Station was chosen as representative of the background NO<sub>2</sub>, CO, and PM<sub>10</sub> concentrations. Table E-5 contains the concentrations measured at the three sites for the past 5 years (1995 through 1999).

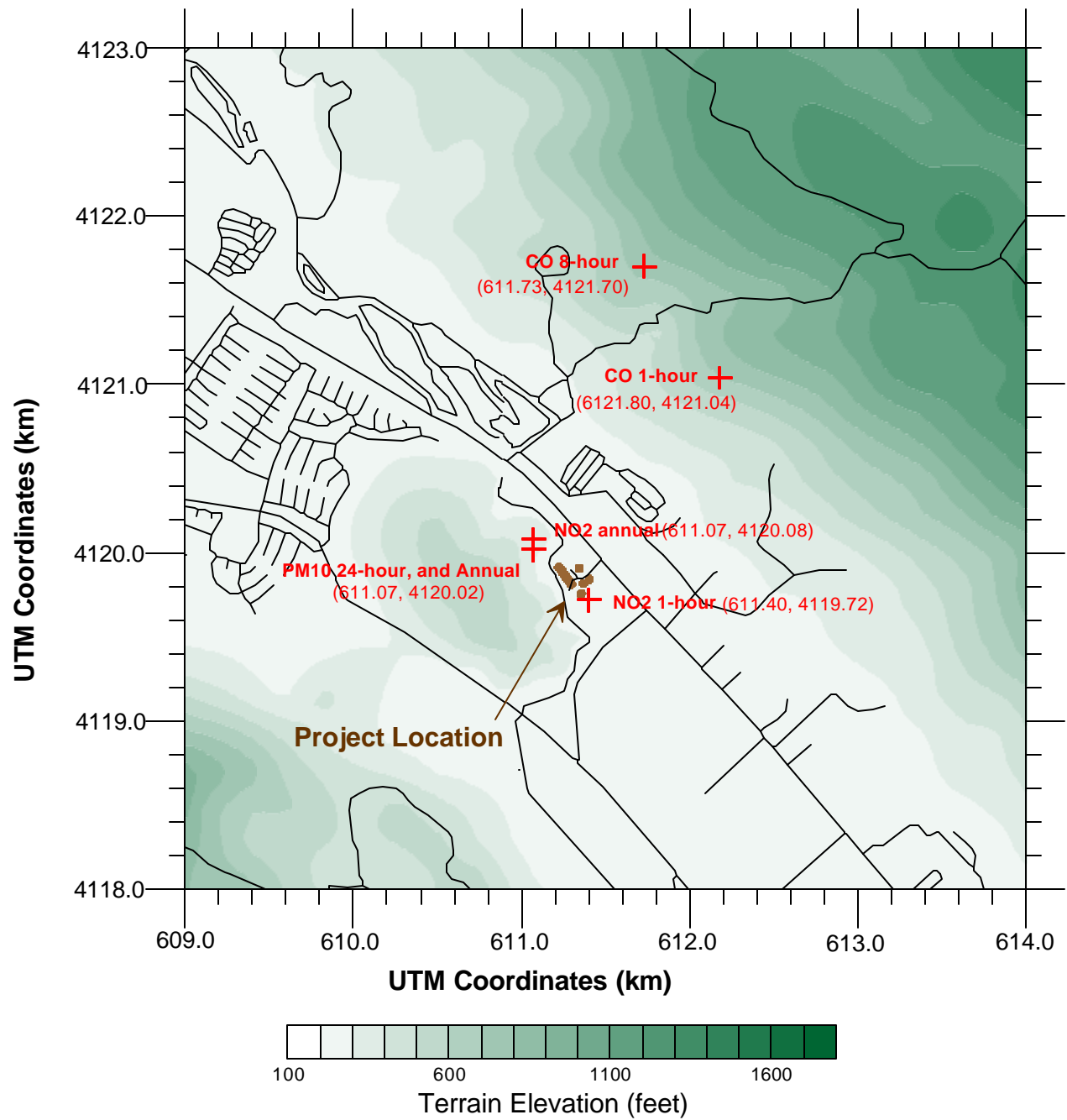


Figure E-1. Location of Project Maximum Impacts.

**TABLE E-5**  
Background NO<sub>2</sub> , and CO Concentrations (µg/m<sup>3</sup>) at San Jose 4<sup>th</sup> Street Monitoring for the Past Five Years (maximums are outlined)

Year	NO <sub>2</sub>	CO	PM <sub>10</sub>	
	Highest 1-hour average	Highest 8-hour average	Highest 24-hour average	Annual-average mean
1995	222	6813	59.7	26
1996	207	8167	76.1	25
1997	226	7128	78.0	26
1998	159	7315	92.0	25
1999	245	7327	114.4	29

<sup>1</sup>GM=geometric mean <sup>2</sup>AM=arithmetic mean

Table E-5 contains the comparison of the ambient standards with the proposed project impacts added to the maximum background concentrations. The National and California ambient NO<sub>2</sub> , CO, and National PM<sub>10</sub> standards are not exceeded from the proposed project. Therefore, in accordance with subsection 414.1, only a visibility, soils and vegetation impact analysis is further required.

**TABLE E-6**  
California and National Ambient Air Quality Standards and  
Ambient Air Quality Levels from the Proposed Project (µg/m<sup>3</sup>)

Pollutant	Averaging Time	Maximum Background	Maximum Project impact	Maximum Project impact plus maximum background	California Standards	National Standards
NO <sub>2</sub>	1-hour	245	188	433	470	---
CO	8-hour	8167	549	8716	10,000	10,000
PM <sub>10</sub>	24-hour	114.4	9.3	123.7	-	150
	Annual average	29	1.1	30.1	-	50

### ***PSD Increment Consumption Analysis***

The impact from the proposed project exceeds the significance levels for one-hour NO<sub>2</sub>, 8-hour CO, 24-hour and annual average PM<sub>10</sub>. But, PSD increments have only been established by EPA for 24-hour and annual average PM<sub>10</sub>. PSD Increments are the maximum increases in concentration that are allowed to occur above baseline concentrations for each pollutant for which an increment has been established. The baseline concentrations are defined for each pollutant and averaging time, and are the ambient concentrations of each pollutant existing at the time that the first complete PSD application affecting the area is submitted. Federal regulations establish the dates after which major and minor source impacts on increment consumption need to be considered. Table E-7 contains the dates applicable to the proposed project. The District's emissions data bank was searched for all sources that have had significant permitted increases in

PM<sub>10</sub> (greater than 25 ton/yr) since January 6, 1975 within 52 km of the project site. No sources were found to meet these criteria. The minor source baseline date, established for each County, is the earliest date after the trigger date on which a complete PSD application was received by the District. As of the time of the submittal of this permit application (May 24, 1999), the District had not received a complete PM<sub>10</sub> PSD Permit Application in Santa Clara County. As a result of this permit application, the Minor Source Baseline date for PM<sub>10</sub> in Santa Clara County has been set to May 24, 1999. Because of this, the only sources that must be modeled for the PM<sub>10</sub> increment consumption analysis are the Project PM<sub>10</sub> emission. No other external sources are required to be included.

TABLE E-7  
Trigger Dates for PM<sub>10</sub> for Proposed Project

Date	PM <sub>10</sub>
Major Source Baseline Date	January 6, 1975
Trigger Date	August 7, 1977
Minor Source Baseline Date	May 24, 1999 (date set by the submittal of this application)

An impact area, a circular area extending from the source to the most distant point where modeling indicates that the ambient impact will be significant, was established. Ambient significance levels are given in Table E-3 for 24-hour and annual average PM<sub>10</sub>. Based on the modeling, an area approximately 2 km in radius surrounding the project site was identified as the area in which the proposed project could have a significant air quality impact on ambient PM<sub>10</sub> levels. The modeled increment is then compared with increments established by EPA. Congress established certain wilderness and national parks as Class I areas (Pinnacles National Monument and Point Reyes National Seashore are the two nearest Class I areas). All other areas in the Bay Area and vicinity are designated Class II areas. The PM<sub>10</sub> impact area falls completely within the Class II designated area. Table E-8 shows the maximum modeled PM<sub>10</sub> increment consumption is below the allowable Class II Increments.

TABLE E-8  
Maximum Modeled Increment Consumption for PM<sub>10</sub>

Averaging Period	Maximum modeled increment consumed(μg/m <sup>3</sup> )	Class II Increment(μg/m <sup>3</sup> )
24-hour	9.3	30
annual	1.1	17

## VISIBILITY, SOILS AND VEGETATION IMPACT ANALYSIS

Visibility impacts were assessed using EPA's VISCREEN visibility screening model. The analysis shows that the proposed project will not cause any impairment of visibility at Pinnacles National Monument or Point Reyes National Seashore. Vegetation and soils in the project study area were inventoried. Maximum project NO<sub>2</sub>, CO, and PM<sub>10</sub> concentrations will not result in significant soil and/or vegetation impacts.

## **CONCLUSIONS**

The results of the air quality impact analysis indicate that the proposed project would not interfere with the attainment or maintenance of applicable AAQS for NO<sub>2</sub>, CO and PM<sub>10</sub>. The applicant's analysis was based on EPA approved models and calculation procedures and was performed in accordance with Section 414 of the District's NSR Rule.